VARIATION AND LAND USE REGRESSION MODELS FOR PM_{10}, $PM_{2.5}$ AND SOOT CONCENTRATIONS IN 19 EUROPEAN STUDY AREAS

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Background and aims :ESCAPE will assess the relationship between long-term exposure to outdoor air pollution using prospective health studies in different European countries, to contribute to revisions of PM standards in the European Union. We will report on between and within study area variation of measured concentrations and performance of the land-use regression (LUR) models.

Methods: We measured $PM_{2.5}$, $PM_{2.5}$absorbance and PM_{10} between October 2008 and April 2011 in 19 European study areas in a harmonized manner. In each study area, 20-40 sites were selected to represent a range of within-city contrasts in population density and nearby traffic intensity. Each site was measured during three 14-day periods spread over the year, using Harvard impactors. Results were averaged, correcting for temporal variation using a centrally located reference site, which was operated year-round. LUR models were developed to explain spatial variation as a function of population density, land-use and traffic intensity near the site.

Results: In all study areas currently available (Ruhr area, Munich, Catalunya and The Netherlands) we found substantial variability of annual averages between and within study areas. For all components, contrasts between background and traffic concentrations were greatest in Barcelona, with ranges of 8.45-24.39µg/m³ for $PM_{2.5}$, 17.78-49.27µg/m³ for PM_{10} and 0.93-4.93m^{-1} for $PM_{2.5}$absorbance). For $PM_{2.5}$, spatial contrasts were smallest in Munich (9.75-17.64ug/m3), while for PM_{10} and $PM_{2.5}$absorbance spatial variation was lowest in Ruhr area (22.50-33.60µg/m³ and 1.04-2.58m^{-1} respectively). Explained variance of LUR models ranged from 71% in The Netherlands to 88% in Ruhr area for $PM_{2.5}$, and from 69% in Ruhr area to 90% in Barcelona for PM_{10}. $PM_{2.5}$absorbance models explained 86% of spatial variation in Barcelona and 97% in Ruhr area.

Conclusion : Contrasts between background and street sites within cities were greater than contrasts between the background levels of different cities. LUR models explained a large amount of spatial variation within all study areas.